

# Evaluation of Mixed-Media Education Sessions on Nurses' Knowledge and Confidence in Caring for Patients on Clozapine

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**ABSTRACT Introduction:** Clozapine is the most effective antipsychotic drug and the only approved pharmacotherapy for treatment-resistant schizophrenia. Despite this, there are many barriers to its use, including life-threatening adverse effects such as agranulocytosis and myocarditis. Another barrier is a lack of health professional confidence and knowledge related to clozapine, which may stem from inadequate or limited clozapine-related training. A standardized, evidence-based protocol to care for patients on clozapine may improve healthcare providers' knowledge and confidence when caring for patients on clozapine. A clozapine Clinical Toolkit (CTK) was developed and implemented in Vancouver, British Columbia, and, with permission, was adapted for use at the Dubé Centre for Mental Health (DCMH). Prior to the CTK being used by nursing staff at the DCMH, small group education sessions were held to assess nurse's current knowledge and confidence regarding clozapine, as well as to provide education on clozapine and the CTK. The education sessions used components of the CTK to assist in educating nursing staff on clozapine. The objective of this study was to determine the impact of the education sessions on nurses' confidence and knowledge related to clozapine.

**Methods:** Groups of one to five nurses at the DCMH were provided mixed-media education sessions on clozapine. Sessions were led by one or two researchers and lasted between 15 to 20 minutes. Pre- and post-education questionnaires were administered to assess nurses' knowledge and confidence related to clozapine. Questionnaire completion was voluntary and anonymous. The results were analyzed using simple summary statistics.

**Results & Conclusion:** The pre-education questionnaire was completed by 81 nurses, and the post-education questionnaire was completed by 80 nurses. The small group, mixed-media education sessions improved nursing knowledge on three out of five clozapine knowledge-based questions, and overall enhanced nurses' self-reported confidence related to clozapine.

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## INTRODUCTION

### Clozapine: Gold Standard Pharmacotherapy for Treatment-Resistant Schizophrenia

Clozapine is classified as a second-generation or atypical antipsychotic, and—when compared to other antipsychotics in the treatment of schizophrenia—has consistently demonstrated superior efficacy (Leucht et al., 2013, Warnez et al., 2014). Although its exact mechanism of action is unknown, clozapine is postulated to have broad receptor activity on D2, D4, 5-HT<sub>2A</sub>,  $\alpha$ 1, and M1 receptors (Nucifora et al., 2017). The extensive receptor interactions of clozapine may explain its superiority over other antipsychotics. However, these vast receptor interactions also lead to several serious adverse drug effects, including agranulocytosis, myocarditis, and constipation, all of which require detailed clinical monitoring to reduce the risk of patient harm (De Berardis et al., 2018). Due to the potential severity of these adverse effects, clozapine use is primarily reserved for treatment-resistant schizophrenia (TRS); notably, it is the only antipsychotic approved by Health Canada for TRS (Remington et al., 2017, Government of Canada, 2015). As approximately 20-30% of individuals diagnosed with schizophrenia will develop TRS (Remington et al., 2016, Nucifora et al., 2019, Warnez et al., 2014), clozapine use is not infrequent; healthcare professionals, including nurses, require appropriate education, training, and treatment protocols to provide optimal care for patients on clozapine.

### Health Professionals' Perceptions of Clozapine

Currently in Canada, there are no standardized guidelines on how to optimally monitor pa-

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tients on clozapine, other than Health Canada-mandated hematological monitoring for agranulocytosis (Government of Canada, 2015). Due to ambiguity in how to best monitor for the other serious clozapine-related adverse effects, healthcare providers may lack confidence in optimally caring for patients on clozapine. This lack of understanding may further cause healthcare providers to fear clozapine and regard it as dangerous, which may alter their ability to inform, treat, and monitor patients adequately (Farooq et al., 2019, De Hert et al., 2016). This lack of understanding may stem from inadequate clozapine-related education (Farooq et al., 2019). For example, a study that assessed the clozapine knowledge of psychiatric nurses found that only one in four nurses achieved an overall score of 50% or higher on a clozapine-adverse drug effect questionnaire (De Hert et al., 2016). Additionally, only 15% of nurses correctly answered a question regarding the clinical presentation of agranulocytosis, and 24% of nurses reported that they did not receive adequate clozapine information during their nursing training (De Hert et al., 2016). Evidently, there is a critical need for nursing education, standardized monitoring guidelines, and clinical tools to assist with the safe and effective use of clozapine.

### **Clozapine Clinical Toolkit: Development, Adaptation, and Education**

To address this healthcare gap, an interdisciplinary healthcare team in Vancouver, British Columbia successfully developed and implemented a clozapine Clinical Toolkit (CTK) (manuscript currently under review). Permission was obtained to adapt and implement this CTK at the Dubé Centre for Mental Health (DCMH) in Saskatoon, Saskatchewan. The CTK is comprised of several individual components (Appendix A), including pharmacy and nursing work standards, a preprinted order set, interdisciplinary guidelines, a nursing monitoring flow sheet, a clozapine discharge communication form, and patient/caregiver clozapine education handouts. In its entirety, the clozapine CTK provides a structured, evidence-based process and clinical supports for optimal inpatient clozapine use. When planning for the implementation of the CTK it was seen to have substantially altered the DCMH nursing staff's roles and responsibilities in caring for patients on clozapine. Thus, in anticipation of the CTK implementation, clinical supports related to the CTK were made available to the DCMH nursing staff at the point of care areas and on an online learning platform. Additionally, small group, mixed-media education sessions on clozapine were held. These sessions included a detailed overview of clozapine, an update on best-practice standards when caring for patients on clozapine, and a review of the CTK. Although the CTK is a separate entity from the education sessions, the clinical supports and other components of the CTK were utilized during the education sessions as teaching tools. The purpose of this study was to assess the impact of the clozapine education sessions on nurses' confidence and knowledge related to clozapine, as well as to obtain feedback from nursing staff regarding the education sessions and accompanying educational materials for ongoing quality improvement.

## **METHODS**

### **Study Setting and Participants**

All DCMH nursing staff members were invited to participate in this in-person study. The DCMH employs approximately 200 nurses. Due to the short window of time available to conduct the education sessions, it was determined that approximately half of

the nurses would be offered the opportunity to participate in the study. Participation was voluntary, and the timing of the sessions was flexible to ensure that patient care was not negatively impacted. The study was conducted through numerous individualized small group mixed-media education sessions. Various types of educational materials and methods were employed during the education sessions, including handouts, a poster board, clinical tools, a didactic lecture, and small group discussions. The sessions took place in a meeting room on the psychiatry ward, with one to five nurses in attendance per session. The education sessions ranged from 15-20 minutes, and included detailed medication information on clozapine including efficacy and safety data. This was followed by the employment of specific elements of the CTK—for example, new nursing monitoring flow sheet and preprinted orders—to discuss optimal monitoring required for patients on clozapine. The sessions concluded with a discussion of CTK-related point of care resources available to nursing staff for ongoing education and clinical support. Session frequency varied, but on average, two sessions were offered each afternoon approximately three to four times per week for eight weeks throughout July and August 2020. Occasionally, sessions were held in the evening to target nursing staff that strictly worked night shifts. Each session was taught by one to two researchers—either a clinical nurse educator, pharmacy student, or nursing student—with the pharmacy student teaching most sessions. During each session, a checklist and standardized script was used by the researcher(s) to ensure that identical information was provided at each session.

### **Pre- and Post- Education Surveys: Self-Reported Confidence and Knowledge**

Prior to the individualized education sessions on clozapine, nursing staff were asked to complete a pre-education questionnaire. The questions were designed specifically for DCMH nursing staff, and were crafted to allow nurses to adequately self-report their knowledge of clozapine best practice standards and their confidence in caring for patients on clozapine. Part one of the questionnaire consisted of five knowledge-based questions (Table 1). Part two of the questionnaire included three confidence-related statements (Table 2), where nurses were instructed to rate their confidence level on a numerical scale. The post-education questionnaire had identical knowledge and confidence-based questions to the pre-education questionnaire, with the addition of two open-ended questions.

### **Ethical Considerations**

Ethics approval was granted by the University of Saskatchewan Behavioural Research Ethics Board (Beh-REB). Participants were made aware that their involvement was voluntary and that results of the study would be presented anonymously and in aggregate.

### **Data Management and Analysis**

Participants were instructed to avoid writing any identifying information on both the pre- and post-education questionnaires; therefore, all survey data was anonymous. After completion of the questionnaires, participants placed their forms into designated manilla envelopes. There was one envelope for pre-education questionnaires and one for post-education questionnaires. The same envelopes were utilized throughout the study period to collect and store the completed questionnaires. The completed questionnaires were stored in a locked drawer in a locked office, and will continue to be stored for ten years as required by the Beh-REB.

Table 1 Survey Responses – Knowledge-Based Questions Answered Correctly

Knowledge question	Pre-education	Post-education
1. Patients on clozapine must have CRP and troponin checked weekly to monitor for agranulocytosis	48%	41%
2. Signs and symptoms of myocarditis include which of the following: (select all that apply) -peripheral edema -jaundice -chest pain -fever and fatigue -dyspnea	78%	91%
3. Clozapine treatment can cause severe neutropenia, which can lead to serious infections and death	96%	99%
4. Clozapine can cause serious constipation, which can lead to death	50%	98%
5. Agranulocytosis and myocarditis from clozapine can occur anytime during clozapine treatment	99%	96%

All questionnaire results were entered into Microsoft Excel in an anonymous manner, and were analyzed using simple summary statistics.

## RESULTS

### Survey Completion

The pre-education questionnaire was completed by 81 nurses, the post-education questionnaire was completed by 80 nurses.

### Knowledge-Based Questions

On the pre-education questionnaire, the average for correctly answered knowledge-based questions was 74%; following education the average increased to 85%. Question #1 and question #5 both accompanied a slight decrease in nursing knowledge after the education sessions by 7% and 3%, respectively. The other three questions, #2, #3, and #4, saw an increase in knowledge after the education sessions by 13%, 3%, and 48%, respectively, as indicated in Table 1.

### Confidence-Based Questions

Nurses' confidence in caring for patients on clozapine increased on all three confidence-based questions, as indicated in Table 2.

### Open-Ended Questions and Verbal Feedback

For the open-ended portion of the post-questionnaire, we asked "What additional information would you like to learn about clozapine?" and also provided a blank space for comments on the education session. The major themes identified through these questions were: 1) nurses wanted to learn more about clozapine-induced cardiovascular adverse drug effects, 2) how to monitor for them, and 3) how clozapine compares to other antipsychotics in terms of these side effects. Participants stated that they found all the materials presented to be very user-friendly and efficient. They appreciated the addition of numerous clozapine-related clinical resources. Several participants mentioned that the education sessions were extremely informative, clarified many questions, and increased their knowledge of clozapine. These themes are visualized in Figure 1.

Table 2 Survey Responses – Confidence-Based Questions

Confidence question	Responses	Pre-education	Post-education
I am confident that I know where to find evidence-based information to improve my understanding of clozapine	Left blank	1%	/
	Strongly Disagree/Disagree	15%	/
	Undecided	27%	5%
I am confident that I am developing and obtaining the knowledge to optimize the care of patients on clozapine	Strongly Agree/Agree	57%	95%
	Left blank	1%	/
	Strongly Disagree/Disagree	8%	/
I am confident that I can effectively discuss the benefits and risks of clozapine with patients	Undecided	21%	4%
	Strongly Agree/Agree	70%	96%
	Left blank	1%	/
I am confident that I can effectively discuss the benefits and risks of clozapine with patients	Strongly Disagree/Disagree	12%	1%
	Undecided	36%	11%
	Strongly Agree/Agree	51%	88%

## DISCUSSION

Limited information is available to guide the most effective strategy for educating practicing nurses, and the same is true regarding clozapine. However, evidence suggests that practical, empowered education strategies can be effective in increasing nurses' competency and professional skills (Chaghari et al., 2017). For this reason, that is the strategy that was employed during the small group mixed-media education sessions for the DCMH nursing staff.

Questions #1 and #5 in the knowledge-based section showed a decrease in knowledge after the education sessions. This result was unanticipated, as the information required to answer the questions correctly was included in the script utilized by the researchers when leading the education sessions. It is possible that these questions were misinterpreted by nursing staff due to a lack of question validation. Question validation requires researchers to test their drafted questions on individuals similar to those who will participate in the study, in order to establish question dependability. Unfortunately, time constraints did not allow for this process to occur, and this could have impacted the nurses' interpretation of the questions. Additionally, Questions #1 and #5 were two of the more complex therapeutic questions, which may highlight a need to incorporate case-based exercises to assess deeper understanding during future nursing education sessions.

Question #4 in the knowledge-based section focused on the mortality associated with clozapine-induced constipation and showed the largest improvement in nursing knowledge following the education sessions. Clozapine-associated constipation is an often overlooked and undervalued clozapine-induced adverse drug effect, despite the fact that the mortality rate is three times higher than that of agranulocytosis (Fowler, 2011). Moreover, constipation occurs more frequently, with gastrointestinal hypomotility occurring in roughly 32% of patients on clozapine compared to agranulocytosis and myocarditis occurring in 0.8-2% and 3% of patients, respectively (Cohen, 2017, De Berardis et al., 2018, Higgins et al., 2019). To address the prevalence of clozapine-induced constipation, a proactive bowel protocol and associated monitoring parameters were included in the CTK. These components of the CTK were utilized as education tools when providing the educa-



**Figure 1** Nursing Themes Identified Regarding the Mixed-Media Education Sessions

tion sessions on clozapine, and as such, extensive education on clozapine-induced constipation was provided during the education sessions. Thus, it was not surprising that while only 50% of nurses answered question #4 correctly prior to the education sessions, 98% of nurses answered correctly on the post-education questionnaire. The mixed-media approach used to educate nurses was designed with the intention to help monitor and mitigate clozapine-related adverse drug effects through standardized, evidence-based monitoring. Ultimately, this approach—aimed to improve nursing knowledge and confidence through empowered learning—correlated with self-reported reduction in nursing stress and anxiety related to clozapine.

Nurses at the DCMH have an extensive list of tasks, often with a heavy patient load. It was anticipated that nurses may not want to commit to time-consuming education sessions or the increased monitoring included in the clozapine CTK. However, the opposite occurred, and the clozapine education sessions were well-attended and extremely well-received, as seen through written feedback on the post-education questionnaire and through verbal feedback to the researchers. Most nurses shared that they experience stress and anxiety when caring for patients on clozapine, and feel as though they do not have adequate clozapine-related training. Most nurses arrived at the education sessions eager to learn, and were attentive and engaged throughout. After the education sessions, several nurses expressed that the clozapine CTK will provide structure and clear expectations, which will lead to comfort and reassurance that they are optimally caring for their patients on clozapine.

## CONCLUSION

Overall, 81 staff nurses attended small group mixed-media education sessions at the DCMH. These sessions improved nursing knowledge on three out of five clozapine knowledge-based questions, and enhanced nurses' confidence in regard to clozapine. Ongoing education services should occur to maintain this competency. Moreover, case-based studies or interactive methods should be utilized to clarify and strengthen the responses to knowledge-based questions 1 and 5. Overall, the education was well-received by participants and will inform future nurse education strategies utilized at the DCMH. In the future, a randomized controlled trial of different nursing education strategies related to clozapine education would help to better articulate the most effective strategy in educating nurses. Further, it would be informative to repeat the post-education questionnaire with the same cohort of nurses at a later point in time to assess knowledge retention.

## CONFLICTS OF INTERESTS

The authors declare no conflicts of interest.

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Appendix The Individual Components That Make up the Clozapine Clinical Toolkit

# CLOZAPINE CLINICAL TOOLKIT

*Promoting evidence-based monitoring, prescribing, and optimal care for patients treated with clozapine*

## 1 Online Learning

*An online learning module was created that is accessible to all Saskatchewan Health Authority staff members. The learning platform reviews in detail the latest evidence for how to care for patients on clozapine, and includes an exam at the end.*

## 3 Pre-Printed Orders

*Clozapine got a brand new pre-printed order form! This means that when a prescriber in the hospital wants to order clozapine, this form must be filled out. The form is designed to aid the prescriber by acting as a checklist to ensure the safest dose and necessary tests are being done.*

## 5 Discharge Form

*A new discharge document has been crafted to ease the transition from hospital to community. The form is meant to act as a summary of the patient's clozapine treatment. The form even has a section where any clozapine-induced adverse effects experienced in hospital can be documented for the healthcare providers in the community to optimally take over the care.*

## 2 Work Standards

*Work standards are a written description of how a particular process should occur in the hospital. These documents have been updated for nursing and pharmacy staff to meet best-practice standards for patients being treated with clozapine.*

## 4 Monitoring Flow Sheet

*A new user-friendly flow sheet has been created to aid nursing staff in monitoring the many possible clozapine-associated side effects. Notably, it now includes monitoring for signs and symptoms of constipation which was previously overlooked.*

## 6 Handouts

*Different informational handouts have been created. One is for patients being treated with clozapine in the hospital; another is for the patient's treatment in the community. The third is for caregivers.*